CLAIMS

1) A method for guiding electromagnetic radiation, comprising:

- providing a photonic crystal made of a bulk material having a first refractive index, said photonic crystal having, at least in a portion thereof, a periodic array of regions with a second refractive index different from the first, said regions having predetermined dimensions and said array having a predetermined period; and
- feeding to said region of said photonic crystal an electromagnetic radiation having a wavelength in the fundamental photonic band of said photonic crystal, wherein said wavelength, the difference between said first and second refractive indices, the dimensions of said regions and the period of said array are so related that, starting from a isotropic distribution of the wave vectors of said electromagnetic radiation within a first angular range that is twice the angular extension of the first irreducible Brillouin zone of said photonic crystal, the group velocity vectors corresponding to said wave vectors are rearranged as concerns direction and module so that at least 50% of said group velocity vectors are directed within a second angular range that is about one-third of said first angular range and the width at half-maximum of the distribution of the modules of said group velocity vectors is lower than about two-thirds of said second angular range.

2) A method according to claim 1, wherein said width at half-maximum is lower than about one-half of said second angular range.

3) A method according to claim 1 or 2, wherein said array of regions has a triangular, square or rectangular geometry.

4) A method according to claim 3, wherein said regions have substantially a cylindrical shape.

5) A method according to claim 4, wherein said array has a equilateral triangular geometry, said second angular range has an extension of $\pi/9$ and said width at half-maximum is lower than about 0.15 rad.

6) A method according to claim 5, wherein said width at half-maximum is

lower than about 0.122 rad.

7) A method according to claim 4, wherein said array has a square geometry, said second angular range has an extension of (π/6) and said width at half-maximum is lower than about 0.224 rad.

8) A method according to claim 7, wherein said width at half-maximum is lower than about 0.164 rad.

9). A method according to claim 4, wherein said array of regions is defined by an array of holes.

10) A device for guiding electromagnetic radiation, comprising:

- a photonic crystal (1, 201) made of a bulk material having a first refractive index, said photonic crystal having, at least in a portion thereof, a periodic array of regions (2) with a second refractive index different from the first, said regions having predetermined dimensions and said array having a predetermined period;
- an optical source (4), optically linked to said region of said photonic crystal (1, 201) and suitable to generate an electromagnetic radiation having a wavelength in the fundamental photonic band of said photonic crystal, said wavelength being so related to the difference between said first and second refractive indices, to the dimensions of said regions and to the period of said array that, starting from a isotropic distribution of the wave vectors of said electromagnetic radiation within a first angular range that is twice the angular extension of the first Irreducible Brillouin zone of said photonic crystal, the group velocity vectors corresponding to said wave vectors are rearranged as concerns direction and module so that at least 50% of said vectors are directed within a second angular range that is about one-third of said first angular range and the width at half-maximum of the distribution of the modules of said vectors is lower than about two-third of said second angular range.

11) A device according to claim 10, wherein said width at half-maximum is lower than about one-half of said second angular range.

12) A device according to claim 10 or 11, further comprising an optical

waveguide (5, 210) interposed between the optical source and said portion of the photonic crystal for feeding thereto said electromagnetic radiation.

13) A device according to claim 12, wherein said optical waveguide (5, 210) is an integrated optical waveguide.

14) A device according to claim 12, wherein said optical waveguide (5) is an optical fibre.

15) A device according to claim 12, wherein said regions (2) have substantially a cylindrical shape.

16) A device according to claim 15, wherein said array of regions (2) is defined by an array of holes.

17) A device according to claim 15, wherein said regions (2) are aligned along an axis and wherein said portion of said photonic crystal comprises a core layer (204) extending in a plane perpendicular to said axis and interposed between a first and a second cladding layer (203, 205), said first and second cladding layers having a refractive index lower than that of said core layer in order to confine said electromagnetic radiation in said core layer.

18) A device according to claim 17, further comprising a substrate layer (207) of a dielectric material and a decoupling layer (202) interposed between said substrate layer and said second cladding layer.

19) A device according to claim 17 or 18, wherein said waveguide (210) is realized on said substrate layer and comprises a ridge waveguide, a rib waveguide or a photonic crystal waveguide having a linear defect region.

20) A device (200) for guiding electromagnetic radiation, comprising a waveguide (210) optically coupled to a photonic crystals (201) having a regular periodicity.